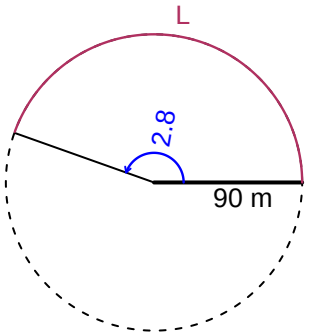
Name: Date:

Trig Final (Solution v24)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 90 meters. The angle measure is 2.8 radians. How long is the arc in meters?

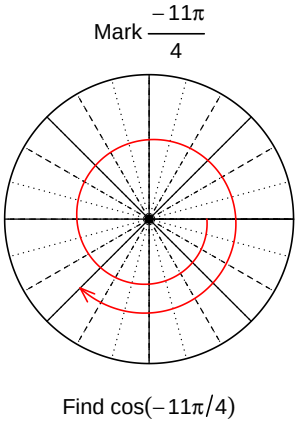


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

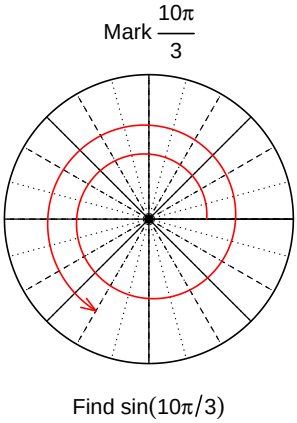
$L = 252$ meters.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{4}\right)$ and $\sin\left(\frac{10\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\cos(-11\pi/4)$



Find $\sin(10\pi/3)$

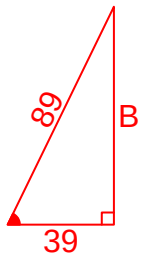
$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-39}{89}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

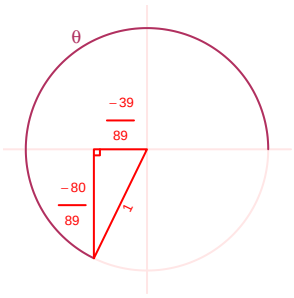
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$39^2 + B^2 = 89^2$$
$$B = \sqrt{89^2 - 39^2}$$
$$B = 80$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-80}{89}}{\frac{-39}{89}} = \frac{80}{39}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 2.27 Hz, an amplitude of 8.62 meters, and a midline at $y = -3.47$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.62\cos(2\pi 2.27t) - 3.47$$

or

$$y = -8.62\cos(4.54\pi t) - 3.47$$

or

$$y = -8.62\cos(14.26t) - 3.47$$